

Overweight Children: Assessing the Contribution of the Built Environment

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I. Introduction

- The prevalence of overweight status in children in the United States has become an increasing public health concern.
- Recent evidence suggests that the built environment (e.g. urban sprawl, pedestrian friendly urban design, etc.) may influence children's weight status.
- Examining the influence of the built environment on children's weight is challenging for a number of reasons.

I. Introduction: challenges

- Overweight status results from an energy imbalance in which caloric intake exceeds energy expenditures. The built environment may influence both energy intake (through its influence on food availability) and energy expenditure (by facilitating or impeding physical activity) (Booth et al., 2005)
- Both energy expenditure and energy intake are influenced by a number of factors.
 - PA is associated with better sidewalks (Jago et al., 2006, Jago et al., 2005), higher quality recreational facilities (Romero, 2005), easier access to parks and recreational facilities (Gomez et al., 2004), greater housing density, etc.
- The impact of some of these factors could be quite complex.
 - Convenience stores versus chain supermarkets (Powell et al., 2006)

I. Introduction: challenges

- The observed correlation between neighborhood environment and weight status of children may be due to parents of overweight and non-overweight children selecting to reside in particular areas rather than due to a causal relationship.

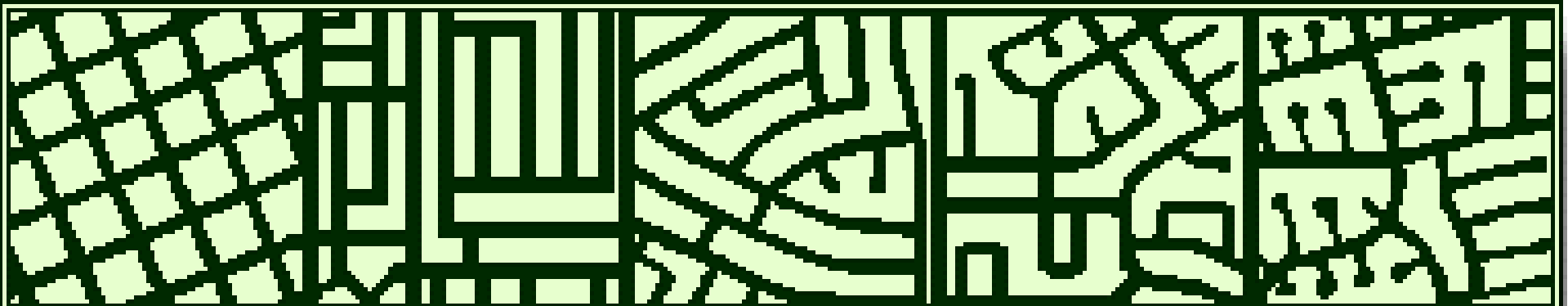
II. Data

- 2002-2003 waves of the Child Development Supplement (CDSII) of the Panel Study of Income Dynamics (PSID)
 - Collected October 2002 – May 2003
 - 2,907 children ages 5-18 years old
 - weights and heights of children were measured by the interviewer
 - Children were classified as being overweight if their BMI is above the 95th percentile of the gender-age specific BMI distribution from CDC Growth Charts.
 - Overall, 21.62% of males and 15.34% of females are overweight in CDSII. The overweight prevalence for children of the same age in NHANES is 18.04 for males and 14.90 for females.
- CDSII was linked to (a) 2000 Census, (b) 2002 Economic Census, (c) 2002 Uniform Crime Reporting Program Data maintained by Federal Bureau of Investigation, (d) Fatality Analysis Reporting System (FARS) of National Highway Traffic Safety Administration, (e) 2000 Topologically Integrated Geographic Encoding and Referencing system

II. Data: environment measures

Variables	Description	Geo level
Built environment characteristics		
<i>Urban Sprawl and Walkability</i>		
Population density	Population in thousands of people per square mile of land	Census tract
Alpha index of connectivity	Actual to maximum possible number of circuits. A circuit is a finite closed path starting and ending at a single node.	Census tract
Urban design: neighborhood was built...		
...before 1950	Median home was built before 1950	Census tract
...b/w 1950-69	Median home was built in 1950-69	Census tract
...after 1969	Median home was built after 1969	Census tract

Urban Street Patterns



Gridiron \approx Fragmented \approx Warped \approx Loops and \approx Lollipops
parallel parallel and lollipops on a Stick

II. Data: environment measures

Variables	Description	Geo level
Pedestrian danger	Annual pedestrian fatality per 100,000 population	County
No physical disorder	Dummy variable that equals one if physical disorder is not observed	Interviewer observed
<i>Food environment</i>		
Restaurant density	Number of restaurants, eating places, cafeterias, etc per 10,000 population	County
Grocery store density	Total number of supermarkets and other groceries (except convenience stores) per 10,000 population	County
Convenience store density	Total number of convenience stores per 10,000 population	County
Specialty food store density	Total number of specialty food stores and markets per 10,000 population	County

III. Methods

- The sample size is reduced from 2,907 to 2,482 due to either missing information on height/weight (300 obs.) or due to missing geo link (141 obs.)
- Due to low geographic clustering we decided to utilize logistic regression technique rather than multilevel modeling technique.

$$\text{Overweight}_i = \alpha + \beta \text{Neighborhood Characteristics}_i + \lambda Z_i + \varepsilon_i$$

- Z includes child age, gender, race, ethnicity; total family wealth and income to needs ratio; mother's BMI, primary care giver education, age, number of children in the household, whether household is female-headed and region of residence.
- As a sensitivity check we repeated analysis excluding underweight children from the sample to find similar results.

III. Results: marginal effects

- **Walkability matters**
 - Children living in the neighborhoods built after 1969 are 7.6% (6.4%) more likely to be overweight than children living in the neighborhood built in 1950-1969(before 1950)
- **Food environment matters**
 - Children living in the counties with 2 convenience stores per 10,000 population are 4.11% more likely to be overweight than children living in the counties with 1 convenience stores per 10,000 population
- **Safety of the built environment matters**
 - Children living in the neighborhoods with no observed physical disorder are 7.61% less likely to be overweight.

III. Results: safety

- The concept of neighborhood safety is multidimensional.
- It encompasses pedestrian safety, safety from crime, and safety of the neighborhood built environment.
- Consistent with some (Burdette and Whitaker, 2004, Burdette and Whitaker, 2005) but not all of the earlier evidence (Gomez et al., 2004, Lumeng et al., 2006, Weir et al., 2006), the present study finds no association between pedestrian safety, crime, and weight status of children.

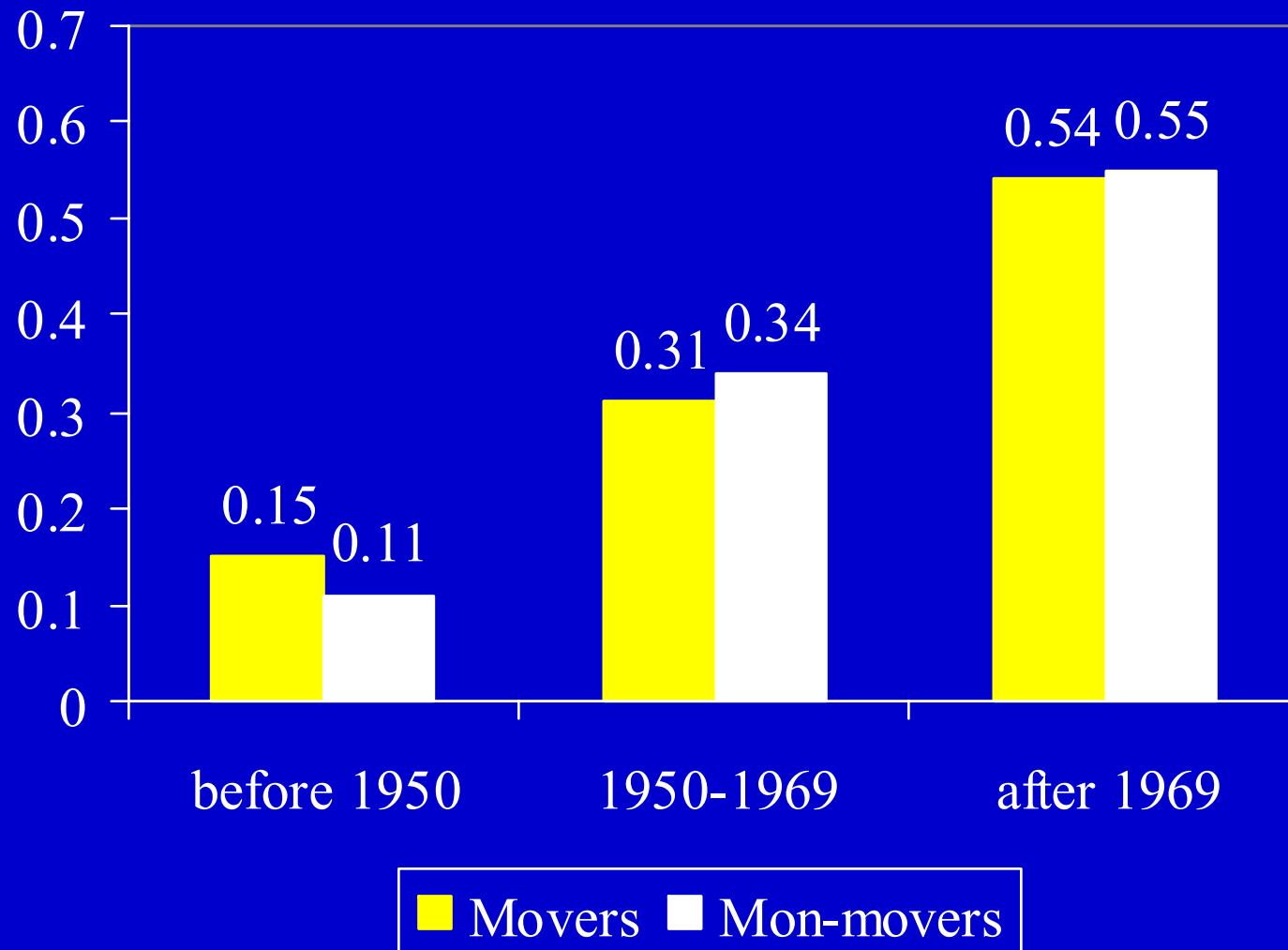
III. Results: mobility

- Do observed patterns of residential moves vary by health status?
- Would the observed patterns of residential mobility tend to *exacerbate* the neighborhood effect or *attenuate* it (creating a bias towards the null)?
 - Are persons in poor health less likely to move?
 - Among movers, are the neighborhoods that persons move to different for persons in good and poor health?
 - Are there differences in neighborhood features for movers and non-movers?
- All core PSID sample families, including the CDSII sample families, were interviewed in 1999.
- The geocode link from the 1999 core PSID interview is used to determine whether families moved between the 1999 and the 2002-2003 interviews.

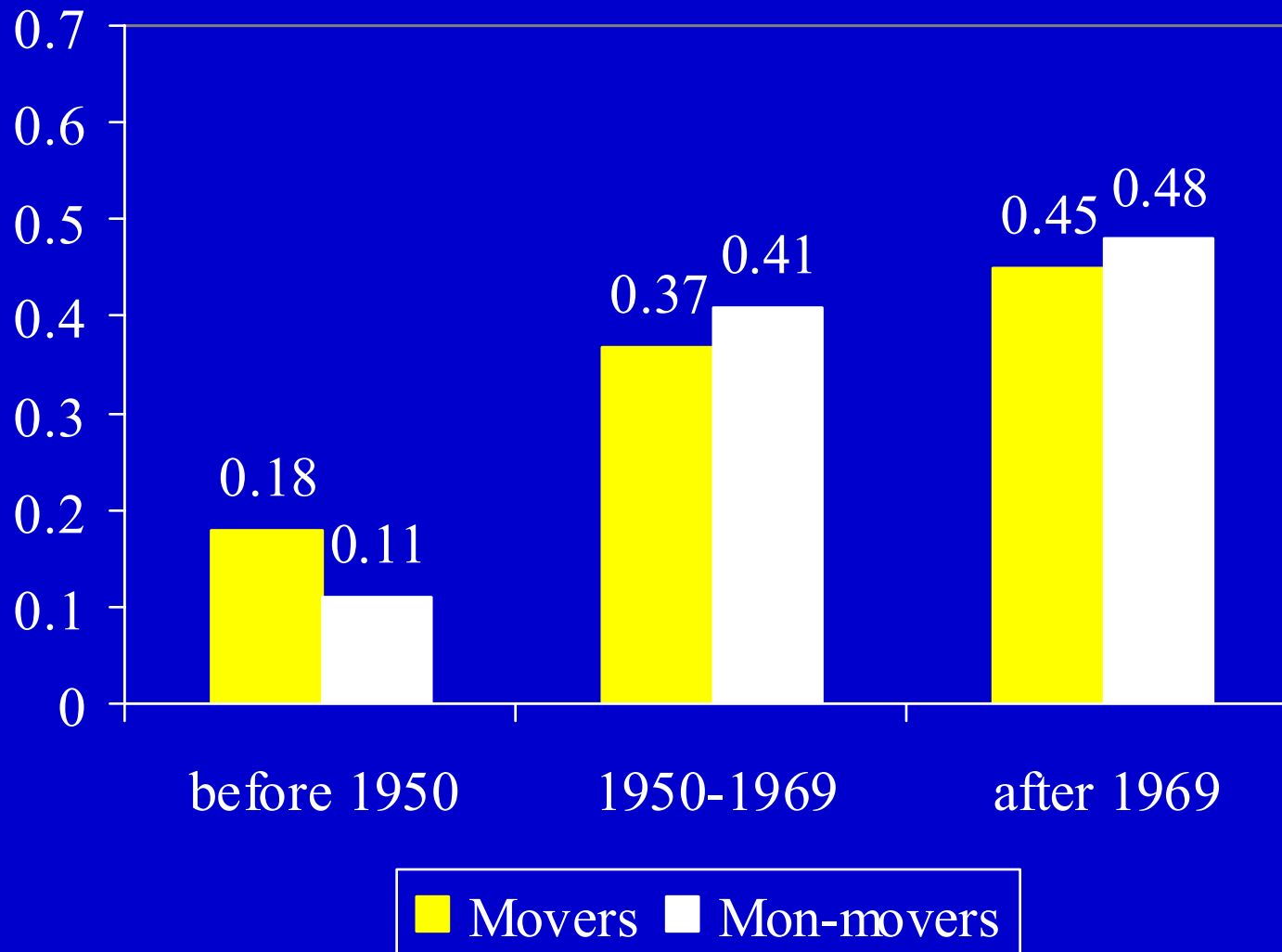
III. Results: mobility

- Between the 1999 core PSID interview and 2002/2003 CDSII interview, 34.5% of overweight and 29.5% of non-overweight children moved. The difference was not statistically significant.
- Families tended to move to counties with convenience store density similar to the county they formally lived in.
- There was also a tendency to move to newer neighborhoods rather than the older neighborhoods they lived in.
- Residential mobility patterns do not differ by overweight status in children.
- This is consistent with the idea that residential decisions of families are not related to the weight status of their children.

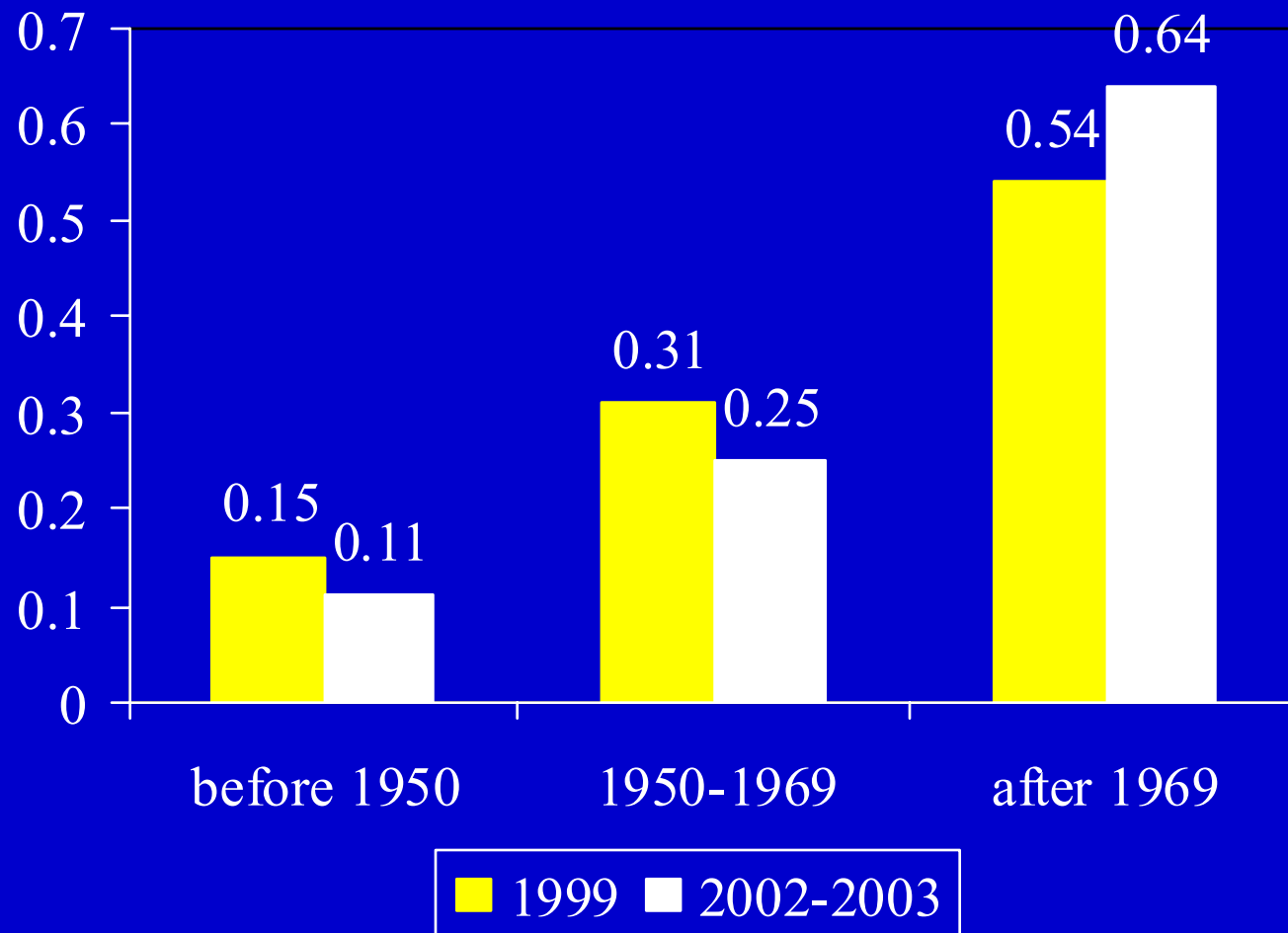
In 1999, overweight children resided in the neighborhoods that were built...



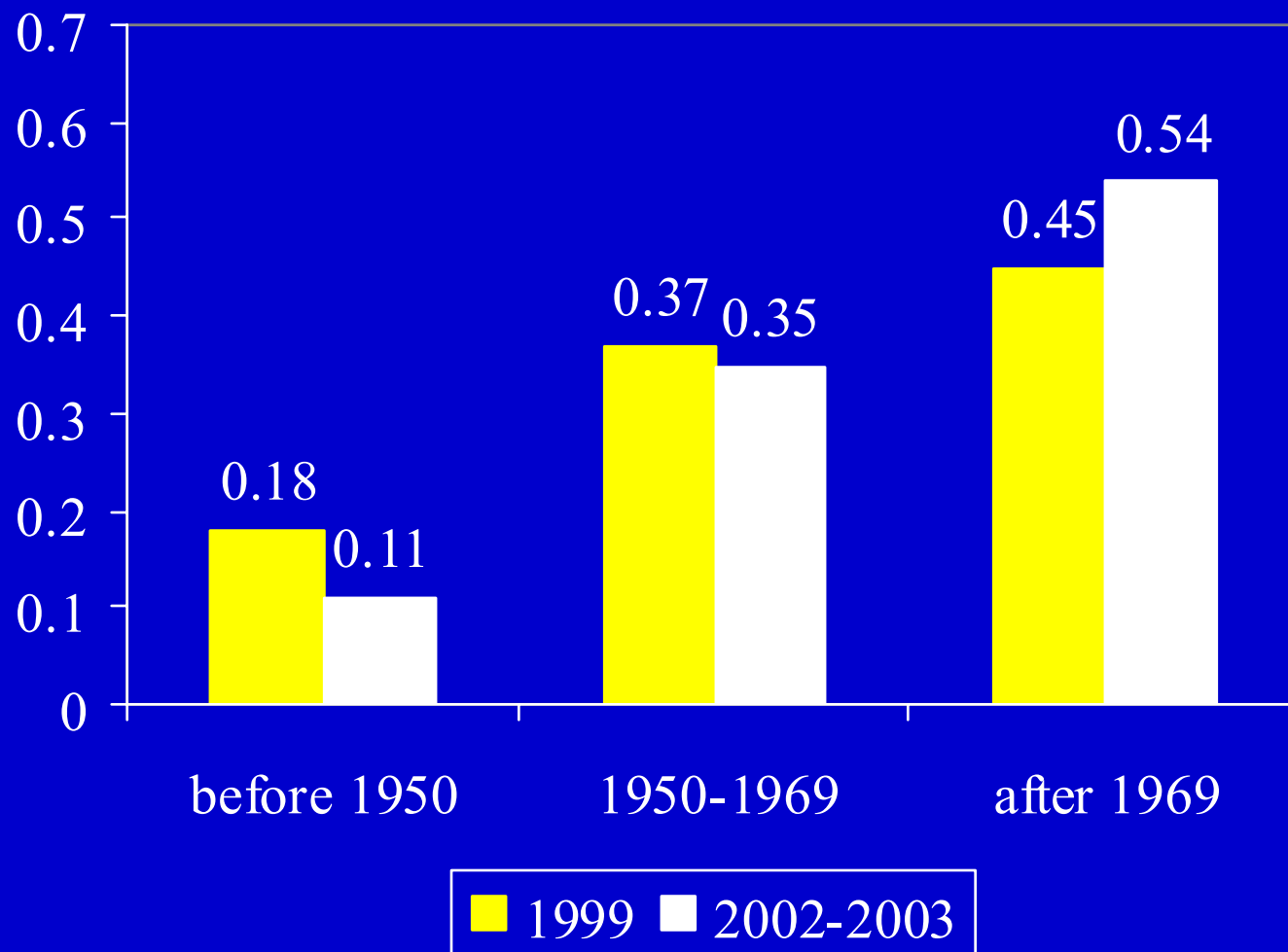
In 1999, non-overweight children resided in the neighborhoods that were built...



Residential mobility pattern for overweight children who moved between 1999 and 2002-2003



Residential mobility pattern for non-overweight children who moved between 1999 and 2002-2003



IV Conclusions

- Built environment matters
 - Walkability matters
 - Food environment matters
 - Safety of the built environment matters
- We find evidence suggesting that residential mobility may play a role in determining children's exposure to neighborhoods of different types.
- However, we did not find evidence suggesting that the probability of moving or the type of neighborhood moved into varied between overweight and non-overweight children.
- This may signal that selection does not play a significant role in the association between the built environment and overweight status in children.